

# DOE-ID NEPA CX DETERMINATION

## Idaho National Laboratory

### SECTION A. Project Title: (Seaborg) Thermophysical Properties Measurements for Seaborg Technologies

### SECTION B. Project Description and Purpose:

Seaborg Technologies is exploring a compact molten salt reactor system which will complement other sustainable energy sources. Fundamental research is required to determine how changes in fluoride salts and fission product concentrations affect key physical properties of the salt system. The Pyrochemistry and Molten Salt Systems Department at the INL will support Seaborg Technologies in a Strategic Partnership Project (SPP) to conduct such fundamental research on these fluoride salts. INL has extensive expertise in the fabrication of molten salts and their surrogates. Additionally, INL is a world leader in measuring thermophysical properties of molten salts. The objective is to make the salt compositions and complete the analysis of the salts and provide reports describing the results. The proposed work is five years in duration and is comprised of the following five phases:

**Phase A** - Fundamental thermophysical properties measurements on a single composition of dUF<sub>4</sub>-KF-NaF eutectic molten salt fabricated at INL.

The eutectic salt will be fabricated at an INL facility. The eutectic salt fabrication is already an existing capability. Samples will be prepared and shipped to several INL facilities to undergo the following measurements: density, viscosity, heat capacity and thermal diffusivity/conductivity. A report will be generated summarizing the measurements and data obtained.

**Phase B** - Fundamental thermophysical properties measurements on dUF<sub>4</sub>-KF-NaF with alternative compositions and surrogate fission products.

The work performed in Phase A will be repeated but with alternative compositions and surrogate fission products suggested by the Seaborg Technologies. A report will be generated comparing the Phase A and Phase B results.

**Phase C** - Fundamental thermophysical properties measurements on other molten salts such as NaOH.

In this phase, different salt systems will be evaluated similar to the work performed in Phase A. Again, salt will be fabricated at INL facilities and measurements performed at applicable INL facilities.

**Phase D** - Capsule irradiation in Neutron Radiography Reactor (NRAD).

In this phase, an irradiation test plan will be developed by the Contractor for Sponsor approval. Irradiation experiment hardware will be fabricated as needed based on a previously utilized design. Highly enriched uranium (usually refers to uranium containing at least 20% U-235) of HEU-bearing salt will be fabricated and then loaded in a capsule and installed in the experiment hardware. The experiment will then be inserted into the NRAD reactor for irradiation per the test plan.

**Phase E** - Property determinations on irradiated salt in National Reactor Innovation Center (NRIC's) Molten Salt Thermophysical Examination Capability (MSTEC).

Samples will be prepared, likely in the Hot Fuel Examination Facility (HFEF), from the irradiated capsules. The samples will then be shipped to MSTEC at the Fuel Conditioning Facility (FCF) for the initiation of thermophysical properties measurements on the irradiated salt samples.

The work will take place within the facilities: MFC-787 (Fuels & Applied Science Building), MFC-752 (Analytical Laboratory), MFC-789 (Engineering Development Laboratory), MFC-768B (Water Chemistry Laboratory), MFC-1729 (Irradiated Materials Characterization Laboratory), MFC-785 (HFEF), MFC-765 (Fuels Conditioning Facility), IF-688 (Energy Innovation Laboratory). The unirradiated molten salts will be analyzed at EIL, EDL, AL, and FASB. The actinide-bearing molten salts will be analyzed at facilities FMF, FCF, AL, HFEF, and IMCL.

The project will generate 200 g of TRU waste during the work specifically in the FMF (AFCI glovebox) and may not be in the form of final waste or package waste. Approximately 250 g of radioactive waste will be generated and some industrial/packaging waste. The final waste form or final waste package may not be TRU waste.

### SECTION C. Environmental Aspects or Potential Sources of Impact:

#### Air Emissions

The samples prepared in HFEF from irradiated capsules will have minor radionuclide emissions. The minor amounts of air emissions produced from the sample preparation are consistent with the scope of work performed at HFEF.

#### Discharging to Surface-, Storm-, or Ground Water

N/A

#### Disturbing Cultural or Biological Resources

N/A

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### Generating and Managing Waste

Generation of radioactive waste will amount to approximately 250 g. Additional amounts of industrial waste is expected to be generated from PPE, packaging material, etc. Approximately 200 g or less of TRU waste will be generated.

### Releasing Contaminants

When chemicals are used during the project there is the potential for spills that could impact the environment (air, water, soil) are to be expected.

### Using, Reusing, and Conserving Natural Resources

All materials will be reused and recycled where economically practicable. All applicable waste will be diverted from disposal in the landfill where conditions allow.

**SECTION D. Determine Recommended Level of Environmental Review, Identify Reference(s), and State Justification:** Identify the applicable categorical exclusion from 10 Code of Federal Regulation (CFR) 1021, Appendix B, give the appropriate justification, and the approval date.

For Categorical Exclusions (CXs), the proposed action must not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action. In addition, the action is not "connected" to other action actions (40 CFR 1508.25(a)(1) and is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1608.27(b)(7)).

**References:** 10 CFR 1021, Appendix B to subpart D, items B3.6, "Small-scale research and development, laboratory operations, and pilot projects."

Final Waste Management Programmatic Environmental Impact Statement [WM PEIS] (DOE/EIS-0200-F, May 1997) and Waste Isolation Plant Disposal Phase Supplemental EIS (SEIS-II) (DOE/EIS-0026-S-2, September 1997).

Final Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada (DOE/EIS-0426, December 2014).

**Justification:** The proposed R&D activities are consistent with CX B3.6 "Siting, construction, modification, operation, and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment."

NEPA coverage for the transportation and disposal of waste to WIPP are found in the Final Waste Management Programmatic Environmental Impact Statement [WM PEIS] (DOE/EIS-0200-F, May 1997) and Waste Isolation Plant Disposal Phase Supplemental EIS (SEIS-II) (DOE/EIS-0026-S-2, Sept. 1997), respectively. The 1990 ROD also stated that a more detailed analysis of the impacts of processing and handling TRU waste at the generator-storage facilities would be conducted. The Department has analyzed TRU waste management activities in the Final Waste Management Programmatic Environmental Impact Statement (WM PEIS) (DOE /EIS-200-F, May 1997). The WM PEIS analyzes environmental impacts at the potential locations of treatment and storage sites for TRU waste; SEIS-II addresses impacts associated with alternative treatment methods, the disposal of TRU waste at WIPP and alternatives to that disposal, and the transportation to WIPP.

The environmental impacts of transferring LLW from the INL Site to the Nevada National Security Site were analyzed in the 2014 Final Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada (DOE/EIS-0426) and DOE's Waste Management Programmatic EIS (DOE/EIS-200). The fourth Record of Decision (ROD) (65 FR 10061, February 25, 2000) for DOE's Waste Management Programmatic EIS established the Nevada National Security Site as one of two regional LLW and MLLW disposal sites.

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Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act)     Yes     No

Approved by Jason L. Anderson, DOE-ID NEPA Compliance Officer on: 03/28/2022